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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/995,736

11/29/2001

Zakya H. Kafafi

N.C. 82,530

1869

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7590

11/19/2003

NAVAL RESEARCH LABORATORY
ASSOCIATE COUNSEL (PATENTS)
CODE 1008.2
4555 OVERLOOK AVENUE, S.W.
WASHINGTON, DC 20375-5320

EXAMINER

KEANEY, ELIZABETH MARIE

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 11/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/995,736

Applicant(s)

KAFAFI ET AL.

Examiner

Elizabeth Gemmell

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 November 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-55 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-55 is/are rejected.
- 7) ☒ Claim(s) 1 and 44 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other: _____

DETAILED ACTION

Receipt is acknowledged of the amendment filed 14 August 2003.

Response to Arguments

Applicant's arguments with respect to claims 1-41 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

Claims 1 and 44 are objected to because of the following informalities:

- Claim 1, line 3: "gree"; should be --green--.
- Claim 1, line 9: "comprise's"; should be --comprises--.
- Claim 44, line 1: "claim 3"; should be --claim 43--.

Claims 1,16,29 and 42 are objected to as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The limitation "a single universal host that *can* (emphasis added) be..." is ambiguous as to whether the host is definitely used for all three dopants at one time or whether the host just has the ability to be used with all three colors but all three are not implemented in the host.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

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The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 50 and 51 recite the limitation "said transparent electrode" in line 1.

There is insufficient antecedent basis for this limitation in the claims.

Claim 52 and 53 recite the limitation "said electrodes" in line 1. There is insufficient antecedent basis for this limitation in the claims.

Claims 54 and 55 recite the limitations "said universal host, said electron transport layer, said hole blocking layer and said hole transporting" in lines 1-3. There is insufficient antecedent basis for these limitations in the claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3,5,7 and 10-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Takahashi et al. (US Patent 6,410,166; hereinafter Takahashi).

Re claim 1: Takahashi discloses, in figure 5 and throughout the disclosure, an organic light emitting diode (11), comprising:

- a single universal host (14) that can be used for red, green and blue dopants for full color display, as specified by the CIE for red, green and blue dopants (column 2, lines 51-52);
 - wherein the universal host comprises an active emitting layer of the OLED (column 18, lines 10-11);
- a hole transport layer (15);
- an electron transport layer (16);
 - wherein the hole transporting layer (15) and the electron transport layer (16) are on opposing sides of the universal host (14), and are in electrical contact with the universal host;
- electrodes (12,17) on opposing sides of the active portion for providing a bias across the active portion;
 - wherein at least one of the electrodes is transparent (column 18, line 6).

Re claim 2: Takahashi discloses the universal host is a material adapted to emit at wavelengths in the blue visible light region or shorter (column 2, lines 51-52).

Re claim 3: Takahashi discloses the universal host is doped with a red emitted material (column 2, lines 51-52).

Re claim 5: Takahashi discloses the universal host is doped with a green emitting material (column 2, lines 51-52).

Re claim 7: Takahashi discloses the universal host is doped with a blue emitting material (column 2, lines 51-52).

Re claim 10: Takahashi discloses at least one of the transparent electrodes comprises a glass substrate coated with a transparent anode material (column 18, lines 6-7).

Re claim 11: Takahashi discloses the transparent anode material is indium tin oxide (12, column 18, line 6).

Re claim 12: Takahashi discloses one of the electrodes comprises a metallic cathode (17, column 18, line 16).

Re claim 13: Takahashi discloses the metallic cathode comprises an alloy of Mg and Ag (column 17, line 13).

Claims 16-18,20,22 and 25-31,33,35,38-43,45,47 and 50-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Borner et al. (US Patent 5,756,224; hereinafter Borner).

Re claim 16: Borner discloses, in figure 1 and throughout the disclosure, an OLED comprising:

- a hole transporting layer (31);
- an electron transport layer (33) that is also a single universal host that can be used for red, green and blue dopants (32; column 4, line 32)
 - wherein the hole transporting layer (31) and the electron transport layer (33) are placed in series and are in electrical contact with each other;
 - wherein the hole transporting layer (31) and the electron transport layer (33) together comprise an active portion of the OLED (3);
- electrodes on opposing sides of the active portion (2,4) for providing a bias across the active portion;
 - wherein at least one of the electrodes is transparent (column 4, line 51).

Re claim 17: Borner discloses the electron transport layer being a material adapted to emit at wavelengths in the blue visible light region or shorter (column 6, lines 14-15).

Re claim 18: Borner discloses the electron transport layer being doped with a red emitting material (column 6, line 13).

Re claim 20: Borner discloses the electron transport layer doped with green emitting material (column 6, lines 13-14).

Re claim 22: Borner discloses the electron transport layer doped with a blue emitting material (column 6, lines 14-15).

Re claim 25: Borner discloses, in figure 1 and throughout the disclosure, the at least one of the transparent electrodes comprises a glass substrate (1, column 4, line 40) with a transparent anode material (column 4, line 48).

Re claim 26: Borner discloses the transparent anode material is indium tin oxide (column 4, line 52).

Re claim 27: Borner discloses one of the electrodes comprises a metallic cathode (column 6, line 63).

Re claim 28: Borner discloses the metallic cathode comprises an alloy of Mg and Ag (column 6, lines 65-67).

Re claim 29: Borner discloses, in figure 2 and throughout the disclosure, an OLED comprising:

- a hole transporting layer (31) that is also a single universal host that can be used for red, green and blue dopants (32, column 4, line 32);
- an electron transport layer (33);
 - wherein the hole transporting layer (31) and the electron transport layer (33) are placed in series and are in electrical contact with each other;
 - wherein the hole transporting layer (31) and the electron transport layer (33) together comprise an active portion of the OLED (3);
- electrodes on opposing sides of the active portion (2,4) for providing a bias across the active portion;
 - wherein at least one of the electrodes is transparent (column 4, line 51).

Re claim 30: Borner discloses the hole transporting layer being a material adapted to emit at wavelengths in the blue visible light region or shorter (column 6, lines 14-15).

Re claim 31: Borner discloses the hole transporting layer being doped with a red emitting material (column 6, line 13).

Re claim 33: Borner discloses the hole transporting layer doped with green emitting material (column 6, lines 13-14).

Re claim 35: Borner discloses the hole transporting layer doped with a blue emitting material (column 6, lines 14-15).

Re claim 38: Borner discloses, in figure 2 and throughout the disclosure, the at least one of the transparent electrodes comprises a glass substrate (1, column 4, line 40) with a transparent anode material (column 4, line 48).

Re claim 39: Borner discloses the transparent anode material is indium tin oxide (column 4, line 52).

Re claim 40: Borner discloses one of the electrodes comprises a metallic cathode (column 6, line 63).

Re claim 41: Borner discloses the metallic cathode comprises an alloy of Mg and Ag (column 6, lines 65-67).

Re claim 42: Borner discloses, in figure 1 and throughout the disclosure, an OLED comprising:

- a single universal host (33) that can be used for red, green and blue dopants having carrier transport properties (column 4, line 32).

Re claim 43: Borner discloses a universal host being doped with a red emitting material (column 6, line 13).

Re claim 45: Borner discloses a universal host doped with green emitting material (column 6, lines 13-14).

Re claim 47: Borner discloses a universal host doped with a blue emitting material (column 6, lines 14-15).

Re claim 50: Borner discloses, in figure 1 and throughout the disclosure, the at least one of the transparent electrodes comprises a glass substrate (1, column 4, line 40) with a transparent anode material (column 4, line 48).

Re claim 51: Borner discloses the transparent anode material is indium tin oxide (column 4, line 52).

Re claim 52: Borner discloses one of the electrodes comprises a metallic cathode (column 6, line 63).

Re claim 53: Borner discloses the metallic cathode comprises an alloy of Mg and Ag (column 6, lines 65-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Picciolo et al. (U.S. SIR H2084H).

Takahashi shows all the limitations above.

However, Takahashi fails to teach or fairly suggest the host material comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene, a red emitting material of 6,13-diphenylpentacene and an electron transport layer comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene.

Picciolo discloses a host and electron transport layer material comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene (column 3, lines 36-37) and a red emitting material of 6,13-diphenylpentacene (column 5, line 65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 5,5'-bis(dimesitylboryl)-2,2'-bithiophene for the host and/or electron transport layer material of Takahashi and 6,13-diphenylpentacene for

the red emitting material of Takahashi because the substitution of one know material for another would be obvious choice of design for one of ordinary skill in the art.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Picciolo and Xie et al. (US Patent 5,989,737; hereinafter Xie).

Takahashi shows all the limitations as shown above.

However, Takahashi fails to teach or fairly suggest the universal host material being 5,5'-bis(dimesitylboryl)-2,2'-bithiophene and the green emitting material being N,N'-diethylquinacridone.

Picciolo discloses a host material comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene (column 3, lines 36-37).

Xie discloses a green emitting material being N,N'-diethylquinacridone (column 12, line 62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 5,5'-bis(dimesitylboryl)-2,2'-bithiophene for the host material of Takahashi and N,N'-diethylquinacridone for the green emitting material of Takahashi because the substitution of one know material for another would be obvious choice of design for one of ordinary skill in the art.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Lin et al. (US Patent 6,512,122; hereinafter Lin).

Takahashi shows all the limitations as shown above.

However, Takahashi fails to teach or fairly suggest the hole transporting layer being 4,4-bis(1-naphthylphenylamino)biphenyl.

Lin discloses a hole transporting layer comprised of 4,4-bis(1-naphthylphenylamino)biphenyl (column 8, lines 10-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 4,4-bis(1-naphthylphenylamino)biphenyl for the hole transporting layer of Takahashi because the substitution of one known material for another would be an obvious choice of design for one of ordinary skill in the art.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Baldo et al. (US Patent 6,097,147; hereinafter Baldo).

Takahashi shows all the limitations as shown above.

However, Takahashi fails to teach or fairly suggest a hole-blocking layer made of bathocuproine.

Baldo discloses, in figure 2 and throughout the disclosure, a hole blocking layer (114) comprised of bathocuproine (column 4, line 35) inserted between the light emission layer (113) and the electron transport layer (115), and wherein the hole blocking layer, hole transporting layer and electron transport layer are in electrical contact with the universal host.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add a hole-blocking layer to the OLED disclosed by Takahashi because with the addition of the hole-blocking layer, the excitations produced in the

emission layer are blocked from diffusing into the electron transport layer thereby confining the excitations only to the emission layer. By confining the excitations within the emission layer the overall brightness and efficiency of the OLED is enhanced (column 3, lines 47-50).

Claims 19,24,32,37,44 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borner in view of Picciolo.

Re claims 19,32 and 44: Borner shows all the limitations as shown above.

However, Borner fails to teach or fairly suggest a red emitting material of 6,13-diphenylpentacene.

Picciolo discloses a red emitting material of 6,13-diphenylpentacene (column 5, line 65).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 6,13-diphenylpentacene for the red emitting material of Borner because the substitution of one known material for another would be obvious choice of design for one of ordinary skill in the art.

Re claims 24, 37,44 and 49: Borner shows all the limitations above.

However, Borner fails to teach or fairly suggest an electron transport layer comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene.

Picciolo discloses electron transport layer material comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene (column 3, lines 36-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 5,5'-bis(dimesitylboryl)-2,2'-bithiophene for the electron transport layer material of Borner the substitution of one known material for another would be obvious choice of design for one of ordinary skill in the art.

Claims 21 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borner in view of Xie.

Borner shows all the limitations as shown above.

However, Borner fails to teach or fairly suggest the green emitting material being N,N'-diethylquinacridone.

Xie discloses a green emitting material being N,N'-diethylquinacridone (column 12, line 62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute N,N'-diethylquinacridone for the green emitting material of Borner because the substitution of one known material for another would be obvious choice of design for one of ordinary skill in the art.

Claims 23, 36 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borner in view of Lin.

Borner shows all the limitations as shown above.

However, Borner fails to teach or fairly suggest the hole transporting layer being 4,4-bis(1-naphthylphenylamino)biphenyl.

Lin discloses a hole transporting layer comprised of 4,4-bis(1-naphthylphenylamino)biphenyl (column 8, lines 10-11).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 4,4-bis(1-naphthylphenylamino)biphenyl for the hole transporting layer of Borner because the substitution of one known material for another would be obvious choice of design for one of ordinary skill in the art.

Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Borner in view of Picciolo and Xie.

Borner shows all the limitations as shown above.

However, Borner fails to teach or fairly suggest a universal host material 5,5'-bis(dimesitylboryl)-2,2'-bithiophene, and wherein the green emitting material is N,N'-diethylquinacridone.

Picciolo teaches a universal host comprising 5,5'-bis(dimesitylboryl)-2,2'-bithiophene (column 3, lines 36-37).

Xie discloses a green emitting material being N,N'-diethylquinacridone (column 12, line 62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute 5,5'-bis(dimesitylboryl)-2,2'-bithiophene for the universal host material and N,N'-diethylquinacridone for the green emitting material of

Borner because the substitution of one know material for another would be obvious choice of design for one of ordinary skill in the art.

Claims 54 and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borner in view of Baldo.

Borner shows all the limitations as shown above.

However, Borner fails to teach or fairly suggest a hole-blocking layer made of bathocuproine.

Baldo discloses, in figure 2 and throughout the disclosure, a hole blocking layer (114) comprised of bathocuproine (column 4, line 35) inserted between the light emission layer (113) and the electron transport layer (115), and wherein the hole blocking layer, hole transporting layer and electron transport layer are in electrical contact with the universal host.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add a hole-blocking layer to the OLED disclosed by Takahashi because with the addition of the hole-blocking layer, the excitations produced in the emission layer are blocked from diffusing into the electron transport layer thereby confining the excitations only to the emission layer. By confining the excitations within the emission layer the overall brightness and efficiency of the OLED is enhanced (column 3, lines 47-50).

Response to Arguments

Applicant's arguments filed 14 August 2003 have been fully considered.

Regarding claims 1-15, the argument is moot in view of the new grounds of rejection.

Regarding claims 16-55, the amendment filled added new limitations, however in searching for these limitations it was found that Bald and Borner both taught the new limitations. The argument was also considered but found not to be persuasive. The applicant argues that the prior art fails to teach a single host that can be used for red, green and blue dopants. The examiner respectfully disagrees. Baldo and Borner teach a single host that is mixed with at least one dopant as shown above. The examiner also respectfully points out that the applicant has not claimed the single universal host being mixed with all three dopants to form a full color display.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Gemmell whose telephone number is (703) 305-1937. The examiner can normally be reached on Monday-Thursday 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (703) 308-4858. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

ENJ
emg

David Bruce
DAVID BRUCE
PRIMARY EXAMINER